TERMINOLOGY AND GEOMETRY: Evolution of Chinese Traditional Architectural Drawing

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Abstract: Chinese traditional architectural drawing possessed a unique set of terminologies and geometric principles that were entirely distinguished from the Western Euclidean geometry, under the category of *tu* (the Chinese character for drawing). This paper etymologically and geometrically investigates the evolution of Chinese traditional drawing, from around the Tang (618-907 CE) and Song (960-1279 CE) Dynasties to the early modern period in the twentieth century. The etymology analysis centers on the terms *di pan*, *shi* and *yang*. The geometrical analysis deconstructs the composition of a selected drawing in the *Yang Shi Lei tu* archives in the Qing Dynasty (1636-1912 CE).

By doing so, this research reveals that the terminologies corresponding to different geometrical forms respectively indicate associations between architectural drawing and the philosophy of Chinese cosmology, and the arrangement of the geometrical forms in the visual picture plane facilitates expressions of the concepts of space and position in geometrical cosmology. Moreover, the architectural *tu* itself as an entity situating in between the technical *tu* tradition and painting tradition, developed architecturalization of pictorial languages.

Keywords: Chinese traditional architectural drawing, *tu*, terminology, geometry, cosmology

INTRODUCTION

This paper is situated in a broad speculation on the development of ancient Chinese architectural drawing. Nowadays, modern Chinese architectural drawings use Western Euclidean geometry and the corresponding terminologies. While the ancient *tu* (圖,[1] the Chinese character for drawing) fully accommodate different terminologies and geometries,[2] they have developed and evolved as well. The motivation for this development is the underlying cultural intentions. Terminologies and geometry, the two aspects of expression, are the products of the translation from intentions into drawings. In contrast, expressions reflect intentions. My main thesis in this article is to reveal the cultural intentions of *tu* by analyzing the expressions, referring terminologies, and geometry, in order to understand their development.

Research in the fields of Chinese *tu* (Behr 2007; Bray, Dorofeeva-Lichtmann, and Métailie 2007; H. Wu 2007; Golas 2014) and painting (Rowley 1960; H. Wu 1989; Chung 2004; Barnhart et al. 1997; Zou 2011) has established a good foundation for this study. The abundant archive of Chinese architectural drawings revealed by other research (The National Library of China etc 2004; Ota 2005; Liu 2006; The National Library of China 2016, 2017, 2018) has made this research possible. However, several of the extant studies on Chinese architectural drawings have shown the existence of a vital gap. Studies that aim to show all the Chinese architectural drawings provide abundant archives including summarizing the terminologies and drawings according to dynasties, while lacking a core analysis on the motivation for such development (J. Wu 1988; Liu 2006). The other situation is that researchers have combined drawings and other images, including buildings, together as their research objects when trying to analyze certain problems, as in Wu's research on the psychoanalysis of the Chinese visual tradition (C. Wu 2004). Further, architectural drawings are used widely as evidence for research on architectural history or restoration of buildings, such as the research on the largest archives of China, the *Yang Shi Lei Tu* (Wang and Zhang 2008; Wang and Zhang 2009; He and Shi 2013). Few studies have examined the development of architectural drawing as a whole and the motivation behind such development, or investigated the relationship between technical *tu* traditions and painting traditions.

The development of Chinese ancient architectural drawing can be divided into two stages. The first stage, which I will call the early informative *tu* stage, accommodated *tu* as a general concept, and *tu* related to construction drawing was composed without differentiation from other technical drawings and in simple lines together with text. The second stage started from around the Tang (618-907 CE) and Song (960-1279 CE) Dynasties, when architectural drawings were distinguished from other *tu* in both terminologies and geometry. It lasted until the early modern period, when Chinese architectural drawing completely adopted western drawing terminology and geometry.

This research focuses on the second stage and etymologically and geometrically investigates the evolution of *tu*. It reveals the denotation and connotation of the terminologies and situates the geometry of architectural drawing in the visual traditions between *tu* and painting. By doing so, this article argues how architectural drawing developed from the early *tu*, and then accomplished and distinguished itself from other technical *tu* while still embracing the cosmological geometry.

1. THE DIFFERENTIATION OF THE TERMINOLOGIES

The formal differentiation and multiplication of the terminologies related to architectural drawing was first documented in the earliest known building manual of China, the *Ying Zao Fa Shi*, first published in 1103 in the Northern Song Dynasty (960-1127 CE), and the terminologies were widely used for a very long period. *Before Ying Zao Fa Shi*, some differentiation of terms related to *tu* had appeared in Chinese texts in the Tang and even earlier periods. The *Yang Shi Lei tu* archives from the Qing Dynasty (1644-1912 CE), the last and largest collection of drawing documents before the modern period in China, possess the same system of terminology. In the modern architectural journals, *The Builder* and *The Chinese Architect*,[3] the terms still appeared on occasion, until they were completely replaced by terminologies translated from Euclidean geometric drawings in the twentieth century.

The terminologies included those that referred to the general concept of drawing and others related to the specific type of drawing. *Yang* (樣) and *shi* (式) are used to represent the general meaning of drawing in vocabulary and they are often put together or used in collaboration with *tu*, such as *yang shi, shi yang, tu yang*, and *yang tu*. The terminologies of *di pan* (地盤), *zheng Yang* or *li yang* (正樣 or 立樣), and *ce yang* (側樣) refer to the specific drawings.

In this part, I focus on analyzing the term *di pan* and the terms *yang* and *shi*. I argue that there are different ontologies and connotations between and among these three terms. This acknowledgement of the terms etymologically challenges the prevalent bold separation and understanding of *di pan*, *li yang* and *ce yang* as the three views of a building, comparable with the terms 'plan', 'elevation', and 'section' in Western Euclidean geometry.

1.1. DI PAN: THE CONNOTATION OF COSMOLOGY

Of all these terminologies, the term *di pan* inherited and even strengthened the connotation of the early *tu*, representing the plan of the building, which means the arrangement of the building on the site, and symbolizing the spatial concept of cosmology, both in the sense of terminology and in geometrical forms.

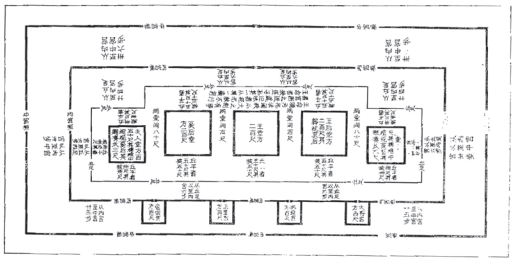

Figure 1: Line illustration of Zhaoyu *tu* (Yang 1987)

The *di pan* drawing style draws the plan of the buildings in the same way as the *tu* represents them. Although *tu* could function as a general concept of the representation of all the forms of drawing, *tu* drawing depicts and describes the arrangement of the buildings on the site, as in the drawings of *Zhaoyu tu* (Yang 1987, 171; Steinhardt 2002, 29)[4] in the Warring States period (475–221 BCE) or in the description text of the classical city plan[5] in *Zhou Li* compiled in the Warring States period. 'Plan' is the basic meaning in the terminology of *tu* as well. *Di pan* drawing was used to refer to the plans of buildings in the drawings of both *Ying Zao Fa Shi* and *Yang Shi Lei*.

Meanwhile, the geometry in *di pan* drawing structured the picture plane using the same logic as the early *tu* drawings. First, *di pan* drawings are composed in an informative way, like the early *tu*, using simple lines, rectangular frames and text as the signifiers of the components. Second, the spatial concepts of cosmology, direction, position, and proportion are the continual focus in the complex drawings of *di pan*. The four positions are interpreted multiple times and the lines are all drawn in strict proportion.[6]

As well as sharing the same geometrical language as *tu*, the etymological connotation of the term *di pan* itself strengthens the connotation of *tu* in the meaning of 'plan'. The original meaning, 'site of the earth', and the rhetorical meaning, 'foundation', form the epistemological context of acknowledgement of the term *di pan* as the plan of a building. For instance, *di pan* in this sentence–"After *Zhuge di*'s enthronement, he sent a messenger, *Ke lun yin*, to offer a fire bead which looked like water essence (to the Tang central court) from the site (*di pan*) of the *Luo cha* kingdom"–in the *Tong Dian,*[7] written in 801 CE in the Tang Dynasty, means 'site of the earth'. Accordingly, the plan–the 'site' occupied by the building–is the *di pan* of the building.

The rhetorical meaning of *di pan* as the root and foundation of the knowledge and principle indicates that *di pan* is the plan–the foundation for constructing a building and the foundation of other drawings, such as

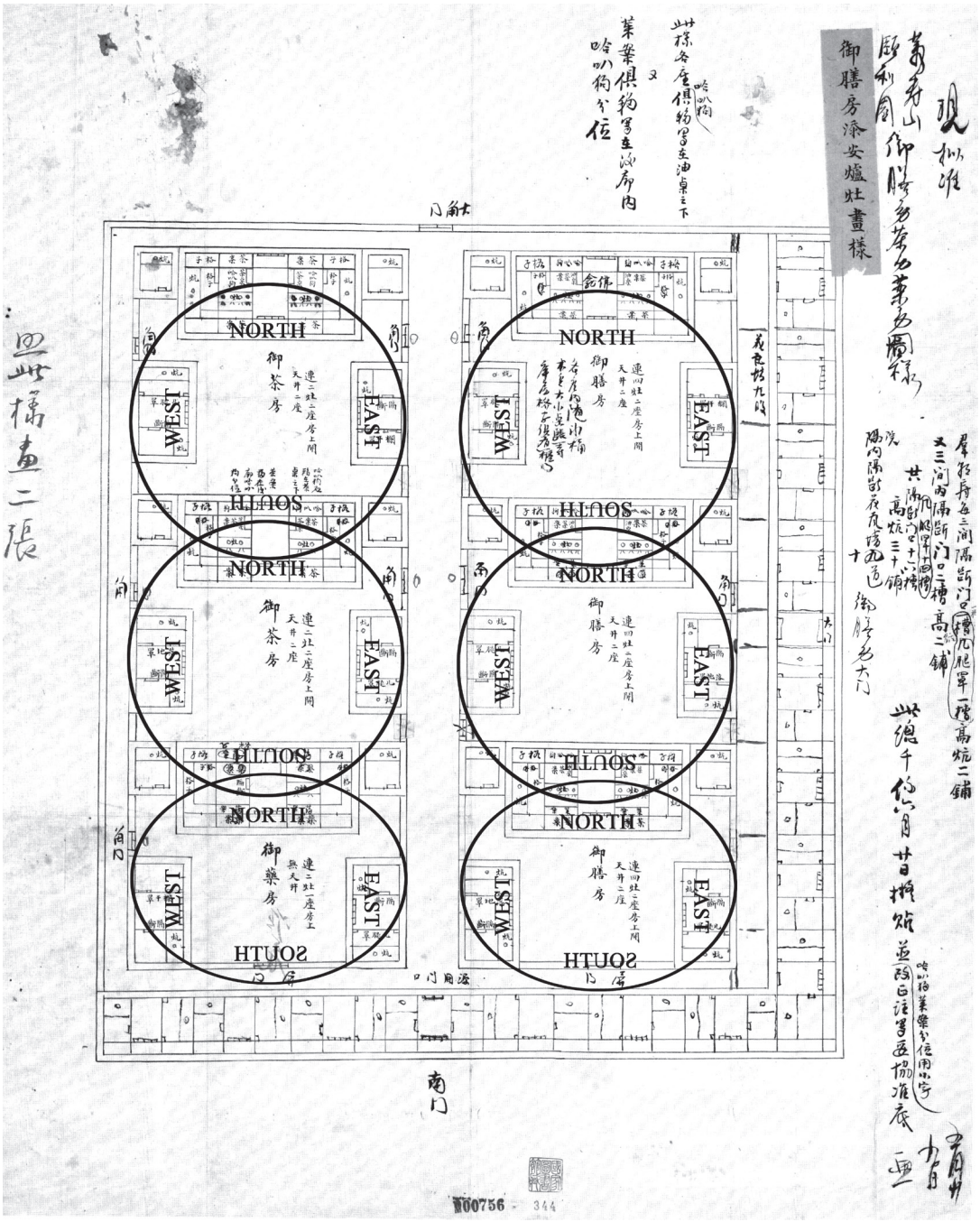

Figure 2: *Di pan tu* of *Yu Shan Fang* in the Summer Palace (©The National Library of China). (The base drawing reproduced from The National Library of China 2018).

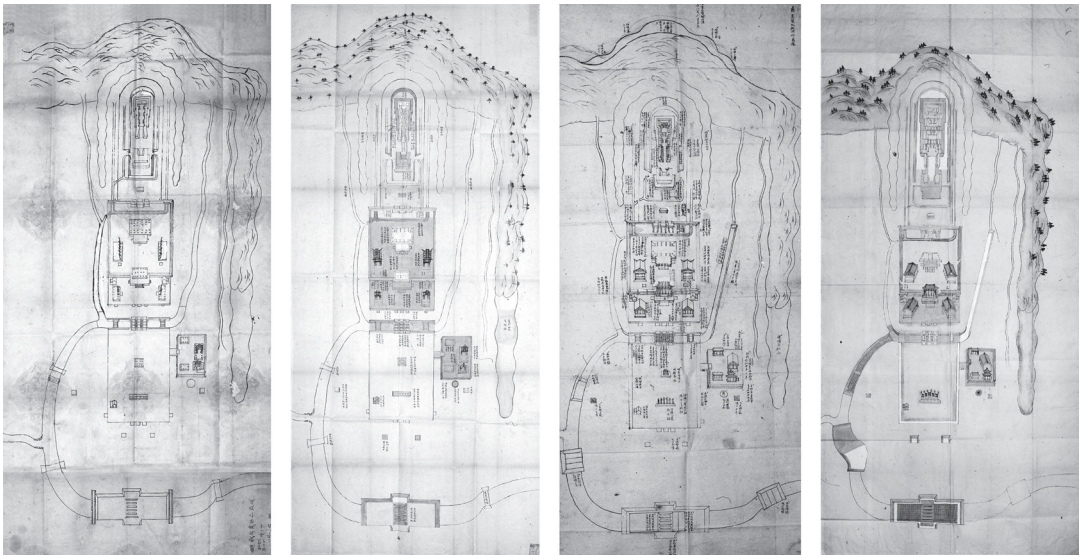

Figure 3: A series of drawings of Hui Mausoleum in *Yang Shi Lei tu archives (©The National Library of China)*. (The National Library of China etc 2004)

in the text of "*Gaining the foundation of the knowledge, is di pan. Just like if a person wants to build a house, he must first construct a strong foundation and then build a house on the top*" in the Confucian text of *Zhu Zi Yu Lei*,[8] edited in 1270.

The *di pan* drawing is indeed the foundation of others in a series of drawings. A series of drawings of the *Yang Shi Lei tu for* the mausoleum of the Qing emperors, which not only indicated the construction of buildings but also the drawing sequences (Wang 2014), indicates the foundation of the *di pan tu*. The series of drawings starts with several of the *di pan tu*, from the simple text and frame as a signifier to the more complex version using a combination of *di pan tu* of single buildings due to the development stages of the construction. The *di pan tu* defined the location and proportion of the buildings,[9] and then the other forms of drawings were developed based on the *di pan tu*. The basic proportions between buildings are fixed and the volume of the building on the picture plane is depicted as it grows and occupies the space of the picture plane.

The other usage of the term of *di pan* gives a direct indication of its association with the spatial concept of cosmology. It refers to one of the two parts of an astronomical device – '*shi*': the square '*di pan*' symbolizing earth (Harper 1978, 1980; Li 2001; H. Wu 2007). The other part is the round '*tian pan*' symbolizing heaven. The illustration patterns on *shi* are the most basic and formal geometrical cosmography (Henderson 1991), corresponding to the spatial concepts of cosmology, which embrace the five basic patterns of cosmology: *si fang* (四方, four directions), *wu wei* (五位, five positions), *ba fang* (八方, eight points), *jiu gong* (九宫, nine palaces), and *shier du* (十二度, twelve divisions). The cosmography on *shi* strongly shaped all the expressions of *tu* expressing the philosophy of cosmology.

Although this device emerged in the Han period (202-220 BCE) and most of those found by archaeologists belong to Han (Li 2001), the use of the terms *di pan* and *tian pan* to refer to the two parts of the device did not occur in extant Han texts until they were used in various divination texts in the Tang Dynasty (Harper 1980). Numerous texts including *di pan*, whether to refer to the cosmological device or the other means, emerged around the Tang Dynasty. This situation once again demonstrates the differentiation that occurred around the time of the Tang Dynasty.

In conclusion, *di pan* is the direct inheritance and reinforcement of connotations of the early informative *tu* in the differentiation of the terminologies and types of drawing around the Tang and Song Dynasties. Considering the evidence above, the first evidence is that *di pan* refers to the representation of the plan of the building, as in the early informative *tu*; the second is that both the terminology of *di pan* and its geometrical composition embrace the concept of cosmology, like the early informative *tu*; and the last is that *di pan* functioned as the foundation of other *tu* after the differentiation.

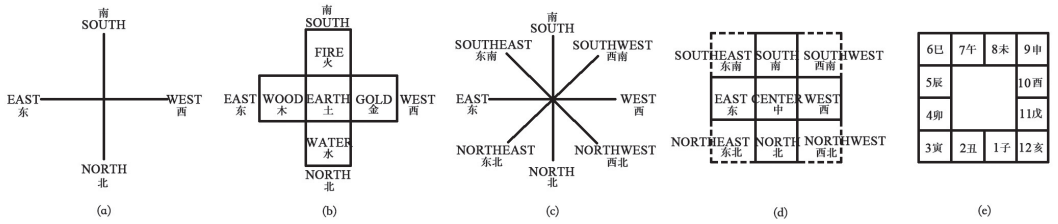

Figure 4: Spatial Concepts of Chinese Cosmology (Han Dynasty): (a) *si fang* (四方, four directions), (b) *wu wei* (五位, five positions), (c) *ba fang* (八方, eight points), (d) *jiu gong* (九宫, nine palaces), and (e) *shier du* (十二度, twelve divisions). (Illustration is drawn based on image in H. Wu 2007, 207).

1.2. *SHI* AND *YANG*: THE CONNOTATION OF COSMOLOGY AND MODEL.

While *di pan* inherits the connotation of *tu*, the terms *shi* and *yang* represent a new meaning–'rule' or 'model'–which did not exist in the early *tu* period. This section investigates what is indicated by the emergence of *shi* and *yang*. Is there any difference between the meanings of *shi* and *yang*? If there is, what is indicated in this difference?

These two terms are easily assumed to have the same meaning, and the difference between 'rule' and 'model' are easily neglected. The denotation of *shi* includes both 'rule' and 'model' in the dictionary, indicating that *shi* can sometimes be the substitution of *yang*. Moreover, the collaborative and interchanged usage of these two terms in the texts strengthens their synonymous nature. The Qing scholar Duan Yucai, in his illustration for *Shuo Wen Jie Zi*[10] according to the Northern Song scholar Xu Xuan's recension of this work in 986 CE, mentioned that "*Yang* now has the same connotation of a rule, model or pattern as *shi*."[11]

However, *shi* and *yang* have different mechanisms in developing the meanings of 'rule' and 'model' respectively. The term *shi* has two ways of accommodating the meaning of 'rule'. One is the denotation of 'rule, standard and law' in the dictionaries, *Shuo Wen Jie Zi* and *Kang Xi Zi Dian*,[12] and has been used in texts since the Zhou (r. 1049/45-256 BCE) and Han (202-220 BCE) dynasties. It is often used together with *fa* (法, law) in this meaning:[13] for instance, "*Using nine shi (rules) to manage the expenses*" in the *Zhou Li*[14] compiled in the Warring States period (475-221 BCE), and "*Institutions and provinces have been precisely founded, and morals and rules have been thoroughly established*"[15] in *Han Shu,*[16] edited in the Eastern Han period (25-220 CE). Considering that the purpose of editing the book *Ying Zao Fa Shi* was to set the standard for financial evaluation of material and labor, *shi* in the book title means 'rule'.

Shi's second way of accommodating the meaning of 'rule' comes from the connotation indicated by the aforementioned astronomical device named *shi*. This astronomical device denotes the acknowledgement of the philosophy of cosmology. In this meaning, *shi* is often written using the character 栻. For this reason, scholars who conduct research on cosmology, such as Harper, have claimed that these two meanings are totally separate (Harper 1980). However, considering the wide influence of cosmology in Chinese culture, which Needham called "correlative thinking" (Needham and Wang 1956), the two meanings have connotative interrelations. The meaning 'rule, standard, and law' represented by *shi* at the first level is in the domain of political institutions, or of ritual and moral standardization. These rules are made and executed in China under significant influence from the philosophy of cosmology (Henderson 1991; Smith 2013).

In contrast, *yang* has a different indication of the meaning 'model', which comes from the concept of intimation. This statement can be seen in the path of developing the meaning of *yang*. *Yang*'s (樣) original meaning is the fruit or seed of the *Xu* (栩) plant,[17] documented in *Shuo Wen Jie Zi,* which was written in the Eastern Han Dynasty (25-220 CE). As the fruit of *Xu*, *yang* is also written as *xiang* (橡). *Xiang* has the meaning of similarity and imitation, from the character's root meaning of *xiang* (象) and is represented as a model or pattern for others who share similarity and imitation. *Yang* borrowed this meaning from its variant character *xiang* (橡).[18]

When architectural terminologies adopt the two terms, the different mechanisms indicate their different connotations. The meaning 'rule, standard, and law' in the term *shi* is the institutional, moral and ritual rule under the influence of cosmology. It occupies an indirective position. Meanwhile, the meaning of 'model' in the term *yang*, which came from the concept of imitation, emphasizes the elegance and standardization

of an intellectual work that directs other works and can be imitated by others. For example, in *Tang Shu · Liu Gongquan Zhuan*, "the calligraphy of *Liu Gongquan* was so famous and widely imitated that it was called the Liu Model."[19] Moreover, the variant usage of the character *yang*, written as '㮋' instead of '樣', in the Tang Dynasty reveals this indication as well. The left part '扌' of the character '㮋' indicates that the 'model' represented by the character is hand-made and human-related. It emphasizes the intellectual work of a model rather than the original source of the character related to the wood indicated in the left part '木' of the character '樣'.

The terminologies as one of the expressions of drawing show that architectural drawing becomes complicated in a different way from western drawings. The differentiation between *di pan* and *yang* is not like the difference between and among plans, elevations, and sections based on the different perspectives of view. Rather, the critical differentiation is that *di pan* shows that buildings should be arranged, and drawings should be composed under the influence of cosmology, while *shi* and *yang* develop the new concept of the model of an intellectual work. The difference between *shi* and *yang* still indicates that the indirect intention behind the model is still the philosophy of cosmology.

2. THE PICTORIAL DEVELOPMENT OF ARCHITECTURAL GEOMETRY

Corresponding to the development and differentiation of the sub-terminology of *di pan* and *yang*, the geometry of drawing has evolved as well. The previous section explained that the geometry of *di pan* inherited and complicated the simple cosmological geometry in the early *tu*. However, *yang* drawing embraced much more complex geometrical characters, which involved not just the complexity of the cosmological geometry as *di pan*. To some extent, there are some similarities between *li yang* (or *zheng yang*) and elevation, and between *ce yang* and section, according to the perspective of Euclidean projection by seeing through the picture plane (Pérez-Gómez and Pelletier 2000). This is also the reason why many researchers of Chinese drawing tend to categorize and align *di pan*, *li yang* and *ce yang* with the three views of plan, elevation and section in the Western Euclidean geometrical system.

This section uses a piece of *li yang tu* (Figure 5) from the *Yang Shi Lei tu* archives, which is now documented in the Forbidden City museum, to reveal the development of the architectural geometry in *yang tu*, and to investigate the difference between Chinese geometry and Euclidean geometry.

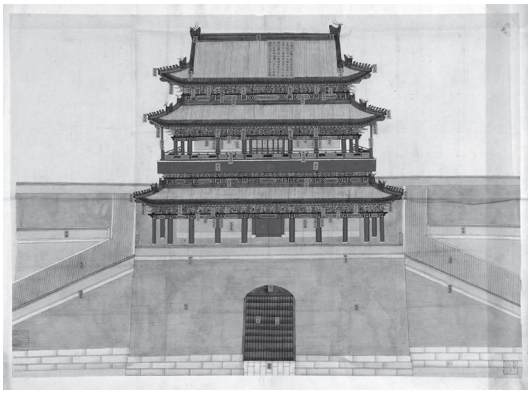

Figure 5: *Li Yang of Zheng Yang Gate (© The Forbidden City Museum)*. (The National Library of China etc 2004)

2.1. THE ARCHITECTURAL TRANSFORMATION OF GEOMETRICAL COSMOLOGY: CENTRAL AXIS AND SYMMETRY

This *li yang* of the Zheng Yang Gate has developed complicated geometry and multi-ply composition layers through the arrangement of lines and duplication of components. The lines in *li yang tu* are arranged according to their positions and the relationships between and among them in the picture plane. The picture plane of the *li yang* is set up parallel with the frontal façade of the building. The lines of the objects parallel to the picture plane are drawn at right angles, as in the early informative *tu* (or like an orthogonal projection for easy acknowledgment), but the lines of the objects perpendicular to the picture plane are depicted in an oblique line. The direction of the oblique lines depends on the position of the lines against the central line of the picture plane, and all tilt toward the central axis; in other words, the left perpendicular lines tilt to the right side, and the right lines, which are symmetrical with the left ones, tilt in the opposite direction at the same angle. In addition, the perpendicular lines in the lower half tilt upwards and those in the upper half tilt downwards. A simple drawing in figure 6 clearly reveals those rules of the line's arrangement.

Some similarities and differences are clearly revealed between the geometry of the *li yang* and the western Euclidean geometry in elevation. If only lines parallel with the picture plane were drawn in the *li yang*, it would be more like the orthogonal elevation. Considering the relationship between the lines that are parallel with the picture plane and those that are perpendicular to it, there is a convergent tendency in *li yang tu*, as in the linear perspective. However, in the Chinese *li yang,* there are multiple centers rather than the single convergent point. When the oblique lines of

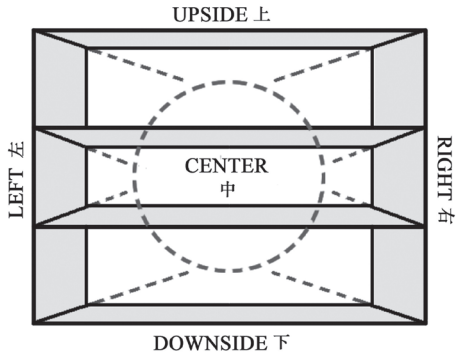

Figure 6: Illustration of the arrangement of the lines (Author 2019)

the part of the drawing on the left or the right side are drawn in the parallel tendency, this makes the quarter of the drawing similar to the composition in axonometric drawing. However, the fact that not all the oblique lines tilt at the exact same angle draws the composition away from axonometric projection. Wu Cong discussed Forseth projection, which is more like Chinese projection than linear perspective and axonometric projection (C. Wu 2004). But the critical difference is still that the lines in *li yang* are not strictly self-disciplined, as in any western scientific geometrical projection.

The arrangement of the lines, therefore, creates a unique hierarchical and relatively subjective geometry in the composition of the *li yang*, rather than the rigid and objective rules of projective Euclidean geometry. The system of Chinese geometry accommodates three levels of geometric language: the central axis and the axisymmetric rule; the four positions of left, right, upper and lower; and the multiple convergence centers constrained on the axis. The highest rank of the geometric language is the central axis and the axisymmetric rule. The components separated by the central axis are obliged to be drawn in symmetry along the central axis. Then, the tendency of the lines upwards and downwards, together with the compulsive symmetry of left and right, shapes the four positions. The multiple convergent centers are correspondingly produced rigidly on the central axis, but are rather flexible in their location in terms of upper and lower. These are the primary and dominant rules, preceding all other rules in the composition of the whole drawing. The other geometric aspects, such as the angle of the oblique lines and the separation between the upward and downward tendencies of the oblique lines, are relatively flexible.

Although the typical composition of geometrical cosmography, as in the idealized city plan, the Luminous Hall, and the illustrations on the device *shi*, is hardly legibly seen in the pictorial *li yang tu*, the four positions of upper, lower, left and right are still clearly indicated in the composition of the geometry by the tendency of those tilted lines. The position of the middle area–indicated by the tendency of the multiple convergent centers compared to the single center of the western linear perspective–furthermore highlights that spatial characters indicated in the drawing correspond to the cosmological concepts of the four directions and five positions. The middle area in the concept of five positions in Chinese cosmology is not one central point, but rather an area similar to the other four positions, and even more dominant than these other positions. Evans, in his article, argued that the development of centers in the central church is associated with the important cultural meaning of centers to western cosmology and the projection of centers into religious central cathedrals (Evans 2000). In Chinese cosmology, five positions with a dominant central position are valued, and therefore projected into such geometry in *tu*, but not the concept of the singular center (Pérez-Gómez and Pelletier 2000), as in western cosmology.

Meanwhile, the rigid spatial characters of the central axis and symmetry are the solid concentration on architectural characters in drawing languages. Ever since the birth of Chinese buildings, whether single buildings or combinations, the axis and symmetry are the basic characters that have remained consistent throughout, from the earliest archaeological findings of building combinations, such as the Xi'an Banpo Hemudu Ruins, to the Forbidden City and many mausoleum sites in the Qing Dynasty; from the building model documented in the Ming Qi funerary ware in the Warring States period and the Han Dynasty to Taihe Dian in the Forbidden City. Because of the correlative influence of cosmology on buildings, these characters are absolute, under the embrace of cosmology; however, compared to other regions and the basic and typical geometrical cosmography, axis and symmetry were already developed as architectural characteristics. The geometric languages in *li yang* that demonstrate these two spatial characters in a rigid way take precedence over other geometric languages, which are relatively flexible. The *yang* drawing, therefore, developed the architecturalizing character, rather than being subject to the composition of basic geometrical cosmography.

2.2. THE PICTORIAL ENDORSEMENT OF ARCHITECTURAL GEOMETRY

The obliqueness of the perpendicular lines creates an illusion of depth in the picture plane. This illusion is created not only by the convergent tendency of perpendicular lines in axisymmetric objects, but also by the way in which the components are depicted. The

Figure 7: Part of Figure 5, *Li Yang of Zheng Yang Gate (© The Forbidden City Museum)*. (The National Library of China etc 2004).

latter are depicted in the form of a 'three-quarter profile' which contains, not only the frontal side, but also part of the lateral side of the object. In the sets of brackets in the *li yang* (Figure 7), for instance, each set is depicted with the parallel plane together with part of the oblique perpendicular plane, as in this kind of 'three-quarter profile' (or like the axonometric projection in Euclidean geometry).

This way of depicting *li yang* adopted a conventional Chinese method of composing pictorial 3D objects into a 2D picture plane. This conventional method has dominated the Chinese pictorial traditions from the very beginning, whether in depictions of living creatures or of objects. The separate brackets and other components in the *Ying Zao Fa Shi* are illustrated in the exact same way. This is the most common way to depict a single object in the illustration plates in Chinese books.

However, although the oblique lateral part of the drawing gives a hint of depth for the objects, this style is still a flattened way of describing human figures, animals, and objects, rather than creating spatial depth, as in the Euclidean geometry. George Rowley interpreted this style as an "ideational" style. He pointed out that the Chinese representation of the mind dealt with the ideas in their essential results in the ideographic image of the thing, rather than providing a descriptive likeness in pre-Tang painting. Objects following this logic were depicted in a flat profile or *en face* mode (Rowley 1960). Wu Hung approved Rowley's conclusion as the best description and interpretation, although there were numerous archaeological findings after Rowley's book (H. Wu 1989). In early pictorial art, this kind of combination of objects on a two-dimensional picture plane without emphasizing spatial depth is very common, such as the images on the Bronzeware in the Warring States period and the images on the ceiling and walls of the Wu Liang Shrine. Wu Hung used the term "cataloguing style" to describe the arrangement of the objects depicted in flat style in his research on the Wu Liang Shrine. The individual units depicted in flat style are organized separately, as in a catalogue, in the early Han pictorial art (H. Wu 1989).

This thesis will call this style a 'three-quarter profile' because the objects in this style of architectural *tu* inherits not only the pictorial convention but, more importantly, the additional 'quarter' of the object embraces an additional indication, in contrast to depicting merely the frontal side of the object. The appearance of the additional 'quarter', in which direction and on which side, is subject to the dominant geometrical rules and therefore intensifies these rules to the viewers. The 'three-quarter profile' way of depicting objects fosters greater meanings that are valuable in Chinese drawing than does the flat frontal view.

Li yang evolved from the early *tu*, which still embraced the cosmological concepts of four directions and five positions. However, it developed dominant architectural characters on the picture plane by following the rigid architectural transformations and geometrical rules of central axis and symmetry. It transformed to become a pictorial *tu* by completing the basic pictorial components in three-four quarter profile traditions. However, in contrast with painting and in keeping with the heritage of cosmological *tu*, it arranged the pictorial components in a "cataloguing style" under the dominant architectural geometry. From then on, *yang tu* was established as architectural drawing, entangled both with the *tu* tradition and the pictorial tradition.

CONCLUSION

From the consideration of the development of the etymology of the terminologies and the geometry in the picture plane, a clear picture emerges of the evolution that occurred around the Tang and Song Dynasty and matured later in history. The terms etymologically accommodate both the connotation from the philosophy of cosmology and the meaning of 'model' as the new ideal of intellectual work. The geometry of drawing, entangled with cosmography and painting traditions, established drawing in this stage as a unique architectural drawing, neither as technical *tu,* nor as painting.

The evolution of *tu* reveals the start of the development of architectural preferences in and around the Tang and Song Dynasties and evokes the unchanging cultural intentions under the influence of the philosophy of cosmology. Moreover, research indicates that architectural drawings are still a form of collective intellectual work, and not constitutive of any individual subjectivity. This is one of the main differences between ancient *tu* and modern architectural drawings. This article provides a foundation for understanding the modernization of Chinese architectural drawing.

ENDNOTES

1 In this article, the Chinese characters in terms of the terminologies of *tu* and ancient texts are written in traditional characters instead of simplified vision. The characters in references by modern researchers are still in simplified Chinese.
2 I use the connotation of geometry in a broad concept. Here, when it refers to the geometry in Chinese drawing, I mean how the lines (and sometimes together with the text) in the picture plane are arranged and organized to form the whole object.
3 *The Builder* and *The Chinese Architecture* were two professional journals published in 1930s.
4 *Zhaoyu tu* is a simply illustrated drawing on a bronze plate excavated the Zhong Shan necropolis during the Warring States period (B.C.475- B.C.221).
5 The classical city plan was firstly documented in the "Record of Trades" section of the Rituals of Zhou. One passage is described as follow: "The master craftsman constructs the state capital. He makes a square nine li on each side; each side has three gates. Within the capital are nine north-south and nine east-west streets. The north-south streets are nine carriage tracks in width." ("方九里，旁三门，国中九经九纬，经涂九轨"). The English version of text comes from (Steinhardt 2002) P24.
6 Archaeology finding show that *Zhaoyu tu* are drawn to scale, see in (Yang 1980). Research revealed its relationship with the philosophy of cosmology, see in (H. Wu 2007).
7 The original text in Chinese is "诸葛地自立后，遣使可伦因地盘献火珠，状如水精，……云得之于罗刹国" documented in the Chapter *Lin Yi* (《林邑》) in the volume *Bian Fang Si* (《边防四》) in the book *Tong Dian* (《通典》).
8 The original text in Chinese is "识得道理原头，便是地盘。如人要起屋，须是先筑教基址坚牢，上面方可架屋" documented in the book *Zhu Zi Yu Lei* (《朱子语类》).
9 The *di pan tu* in Yang Shi Lei tu archive is drawn to scale. See in (Wang 2016)
10 *Shuo Wen Jie Zi* is the earliest Chinese dictionary edited by Xu Shen in Eastern Han Dynasty (25-220).
11 The original text in Chinese is "今人用樣爲式樣字。像之假借也。唐人式樣字從手作掾." Reference is searched in the *Han Dian* database: https://www.zdic.net/hans/樣.
12 *Kang Xi Zi Dian* is a dictionary edited by the court in the Qing dynasty (1636-1912), which gathered together the varieties of ancient meanings of thousands of Chinese characters and the original texts where these meanings were shown.
13 (Cullen 1980)
14 The original text in Chinese is "以九式均節財用." documented in the Chapter *Da Zai* (《大宰》) in the volume *Tian Guan* (《天官》) in the book *Zhou Li* (《周禮》).
15 The original text in Chinese is "樞機周密，品式備具." documented in the volume *Xuan Di Ji* (《宣帝紀》) in the book *Han Shu* (《漢書》)
16 *Han Shu* is the first historical text edited in series of biographies, edited by Ban Gu in the Eastern Han Dynasty.
17 *Xu* is a species in the family of *Xylosma racemosum (Sieb. et Zucc.) Miq.* in Latin. Reference is searched in the *Han Dian* database: https://www.zdic.net/hans/樣.
18 The Qing scholar Duan Yucai in his illustration for *Shuo Wen Jie Zi* according to the Northern Song scholar Xu Xuan's recension of it in 986, mentioned "*Yang* now has the same connotation of a rule, model or pattern with *shi*, borrowing the meaning from the character of *xiang* (像)." However, he did not mention the difference between the two. The original text in Chinese is "今人用樣爲式樣字。像之假借也。唐人式樣字從手作掾." Reference is searched in the *Han Dian* database: https://www.zdic.net/hans/樣.
19 The original text in Chinese is "公權在元和間書法有名，劉禹錫稱爲柳家新掾", documented in the Chapter *Liu Gong Quan Zhuan* (《柳公權傳》) in the book *Tang Shu* (《唐書》).

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